Including the Effect of Latent Mobility Styles in Mobility as a Service Plan Choice Models

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The repetitious nature of travel choices makes it prone to habituation. Even though people are sensitive to factors that they think are important in making choices, much of their travel behaviour is actually driven by pure repetition and habit rather than by conscious deliberation (Schlich and Axhausen, 2004; Friedrichsmeier et al., 2013). These regular behavioural patterns also compel individuals to invest in mobility tools (e.g. public transport passes, licenses) that suit their lifestyles. The prevailing individual travel characteristics, mobility tools and regular travel patterns define an individual's so-called 'mobility style'. These mobility styles predispose peoples' every travel related decisions, and are likely to influence their preferences towards new mobility services, such as Mobility as a Service (MaaS)

MaaS is a new transport concept, in which the mobility distribution chain is restructured by a mobility operator who integrates all the offerings of transport providers and supplies them to users as a single service (Kamargianni and Matyas, 2017). A digital platform or mobile application, allows users to plan, book and access all the transport modes available in the MaaS system. In addition, MaaS offers users the option to purchase mobility either in a pay as you go manner or by buying monthly mobility plans which include a predetermined amount of each transportation service. Against this background, the aim of this paper is to test the hypothesis that the heterogeneous mobility styles of individuals influence their preferences in choosing Mobility as a Service (MaaS) subscription plans.

The case study city is London. The data used for the study is based on a survey carried out in Greater London between November 2016 and April 2017. It consists of a revealed preference (RP) section inquiring about the socioeconomic and current travel habits of the respondent and a stated preference (SP) experiment specifically designed to examine preferences for MaaS plans (Matyas and Kamargianni, 2017). In the SP, respondents are presented with 4 sets of hypothetical MaaS plans and are asked to indicate their preferred one. The SP design was tested with several rounds of focus groups before finalising. The sample used for this study is that of 4,558 SP observations collected from 1,138 individuals. The SP has 4 alternatives: three fixed plans and one menu option where the users can determine which and how much of each mode they would like. The core attributes in the plans are the transport modes: public transport (with two levels: unlimited bus or unlimited PT, to match the existing monthly pass options offered in London), bike sharing (yes, no), car sharing (with levels denominated in time), and taxi (with

levels denominated in distance). Further attributes include the cost of the plan, and additional special features such as 'transferability of unused travel to the next month' and '10-minute taxi guarantee'. The SP is context-dependent, meaning that the attributes and levels shown to each respondent are dependent on our prior knowledge about the individual (for example, whether they own driving licenses or have a disability that prevents them from using a certain transport mode). Further, a pivot design is used, whereby the SP levels are based on information from the travel habit questionnaire that precedes the SP.

The outcome of a choice made from the options is either one of the three plans *or* any combination of the individual features in the menu option. When analysing the data, aggregation of alternatives method is used to reduce dimensionality (Ben-Akiva and Lerman, 1985; Pinjari et al., 2008). To incorporate individual heterogeneity into the analysis, latent class discrete choice models are used. Latent class models consist of two components: a class membership model and a class specific model (Greene and Hensher, 2003; Vij et al 2013; Kamargianni and Polydoropoulou, 2013). The class membership model links the latent modality styles to individuals' travel characteristics and segments individuals into a finite number of classes. The individuals within a class share common characteristics, while those in different classes are dissimilar to each other regarding those characteristics (Coogan et al., 2011). The number of classes and the exact variables to include in the class membership model will be determined based on extensive testing; however, candidate variables related to modality styles are: licence ownership, car ownership, use of car, public transport pass ownership, car club membership, car club awareness, bike sharing usership, bike sharing membership, frequency of taxi usage. The second component of the latent class model is the class specific model, which shows the MaaS plan choice behavior broken down by each mobility style user group. In determining the final model specification for the sample population, numerous models will be estimated with varying utility specifications.

The results are expected to indicate significant differences between preferences for MaaS plans based on the latent mobility style of the respondent. The outcomes of this analysis will provide valuable insights on how mobility styles affect MaaS plan choice. This can be useful to a number of stakeholders including transport authorities, companies developing MaaS products, and researchers interested in understanding the heterogeneous preferences for MaaS plans.

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